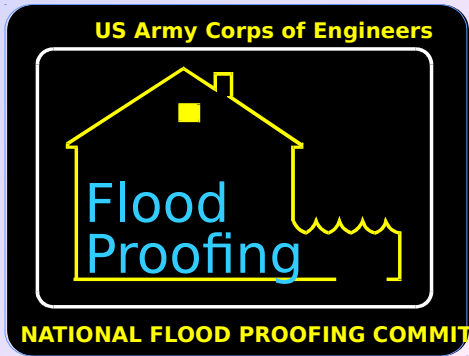
US Army Corps
of Engineers

Larry S. Buss, P.E.

Chief, Hydrologic Engineering Branch

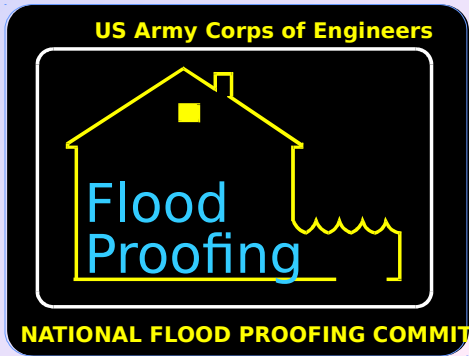
Omaha District

Chair, National Flood Proofing Committee



US Army Corps
of Engineers

National Flood Proofing Committee



US Army Corps
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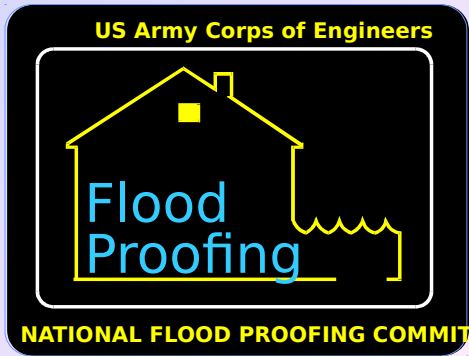
Maximizing the Use of Non Structural Measures

- Opportunities
- Innovation
- Challenge
- Leadership



US Army Corps
of Engineers

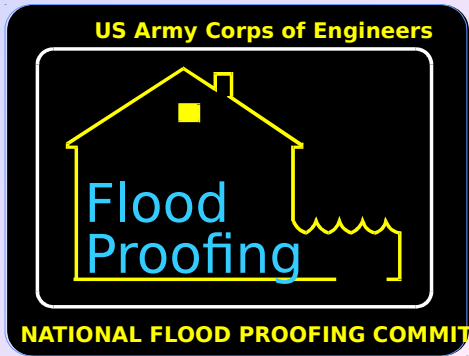
Environmental Operating Principles

- Achieve Environmental Sustainability
- Seek balance and synergy by designing economic and environmental solutions that support and reinforce one another
- Find innovative win-win solutions to the Nations problems that also protect enhance the environment

US Army Corps of Engineers
Flood Proofing
NATIONAL FLOOD PROOFING COMMIT

US Army Corps
of Engineers

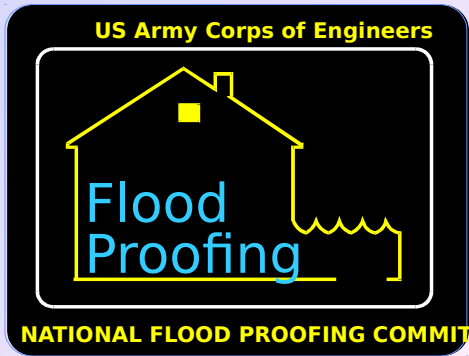
- Corps of Engineers Projects
  - Arlington, Texas
  - Glendive, Montana



US Army Corps
of Engineers

Arlington, Texas

Johnson Creek
(Being Implemented)



US Army Corps
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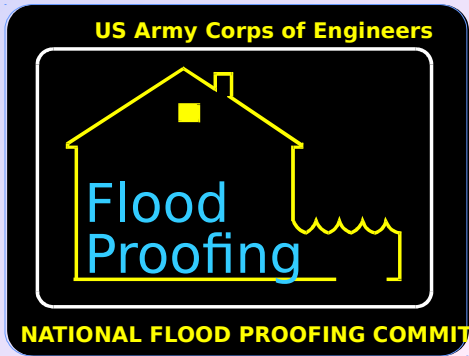
- Problem
  - Rapidly developing community
  - Structures in flood prone areas that were previously out
  - Many structures subject to flooding as frequently as the 2-year
  - Loss of habitat
  - Unmet recreation needs



US Army Corps
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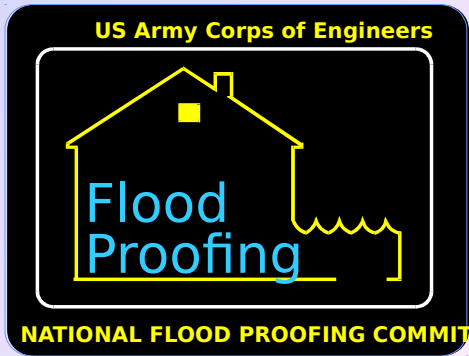
- Corps Investigation
  - Traditional Structural Investigation
    - Concrete / Gabion lined channel
    - BCR ~ 1.16
    - Rejected by local sponsor as too environmentally damaging



US Army Corps
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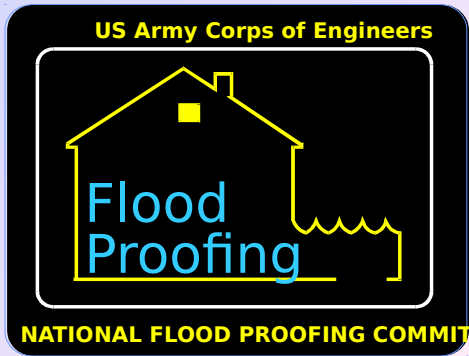
- Corps Investigation (cont)
  - Non-structural Investigation
    - Removal of homes
    - Based on flood damage reduction only
    - BCR ~ 0.85



US Army Corps
of Engineers

Opportunities the Innovation Flood Plain

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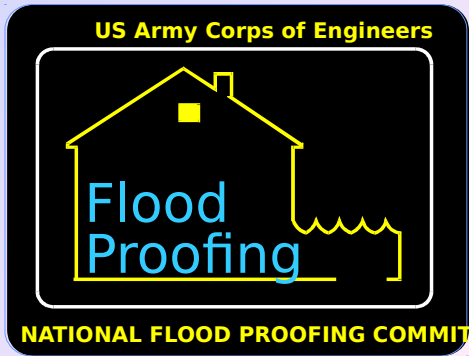
New Uses of

Evacuated



US Army Corps
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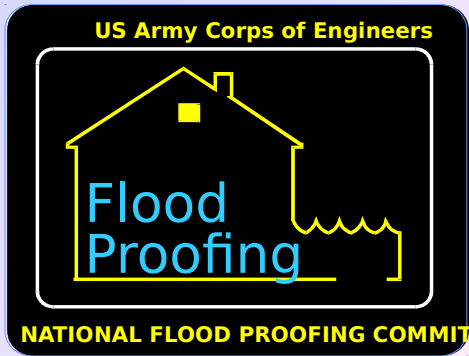
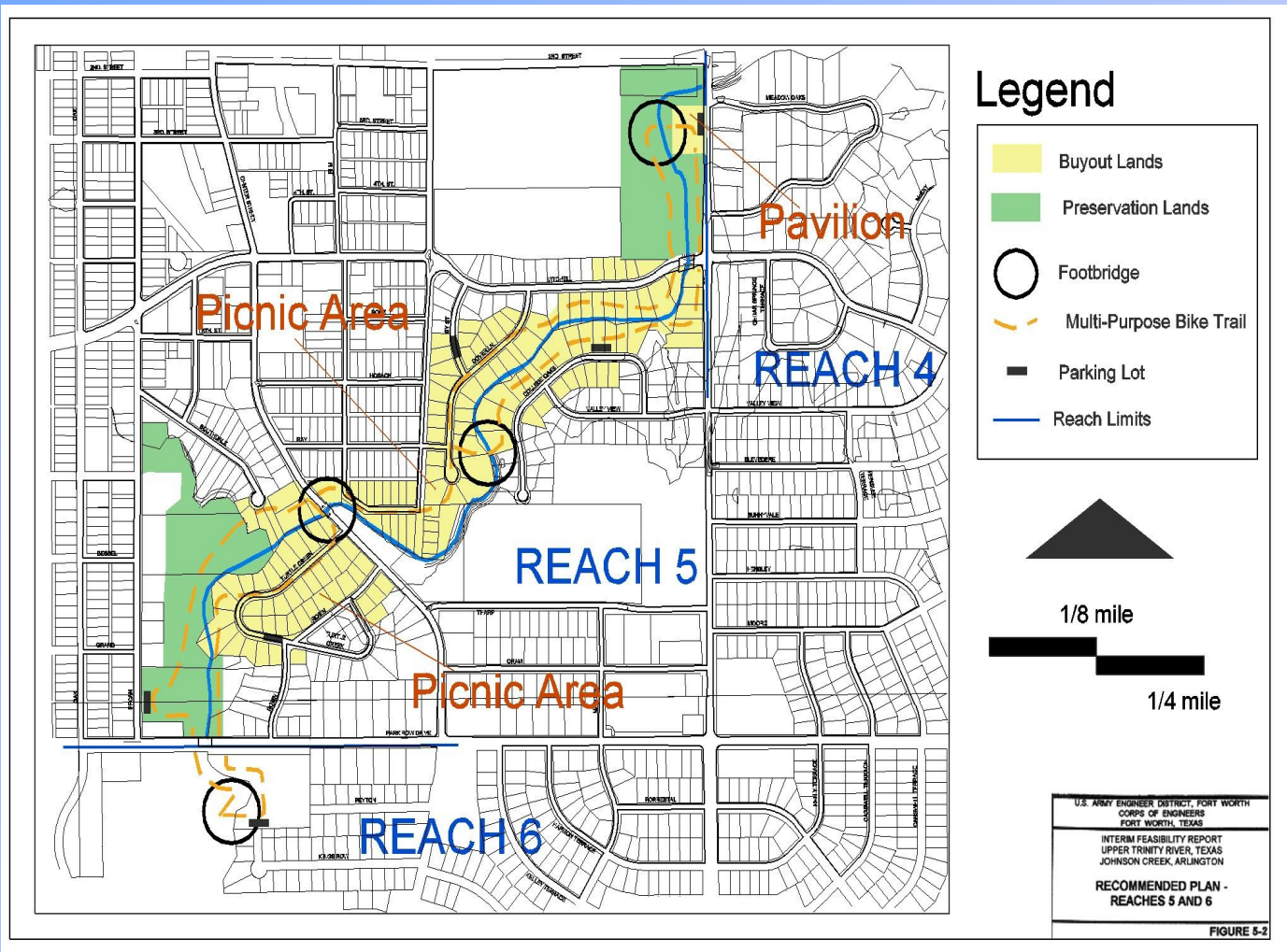
- Implemented Alternatives
  - Acquire and remove 140 structures in the 25-year flood plain
  - Acquire 155 acres of undeveloped areas in the corridor
  - 11,404 feet of concrete trail
  - 70 uncovered picnic sites
  - 1 covered pavilion
  - 4 footbridges
  - 6 access points
  - 60 parking spaces for access points
  - Information kiosk
  - Plantings



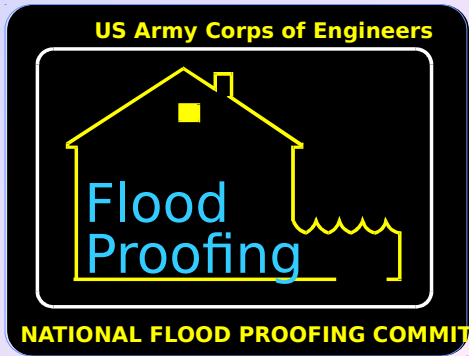
US Army Corps
of Engineers



US Army Corps of Engineers
Flood Proofing
NATIONAL FLOOD PROOFING COMMIT

US Army Corps
of Engineers

- Structural
  - **BCR ~ 1.16**
- Non Structural
  - **Flood damage reduction only**
    - **BCR ~ .85**
  - **Flood damage reduction and recreation in the evacuated flood plain and recreation in the ecosystem restoration area**
    - **BCR ~ 1.6**



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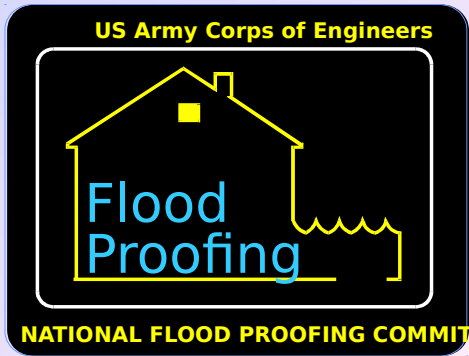
Project/Economic Cost

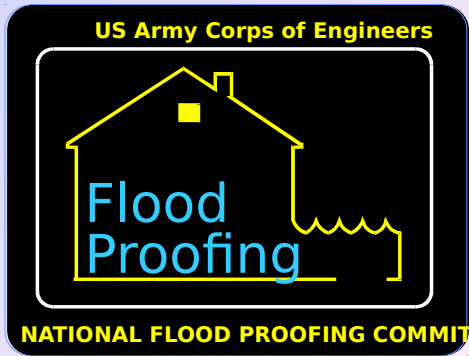
Economic Restoration Cost	Project Financial Cost	Economic Cost
Land	$ 2,312,800	$ 0
Fish & Wildlife Facilities	$ 210,800	$ 0



US Army Corps
of Engineers

Community Support ?
Positive

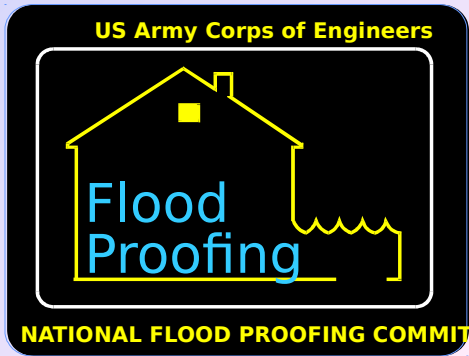
Implementing



US Army Corps
of Engineers

Glendive, Montana

Yellowstone River
(Reconnaissance)



US Army Corps
of Engineers

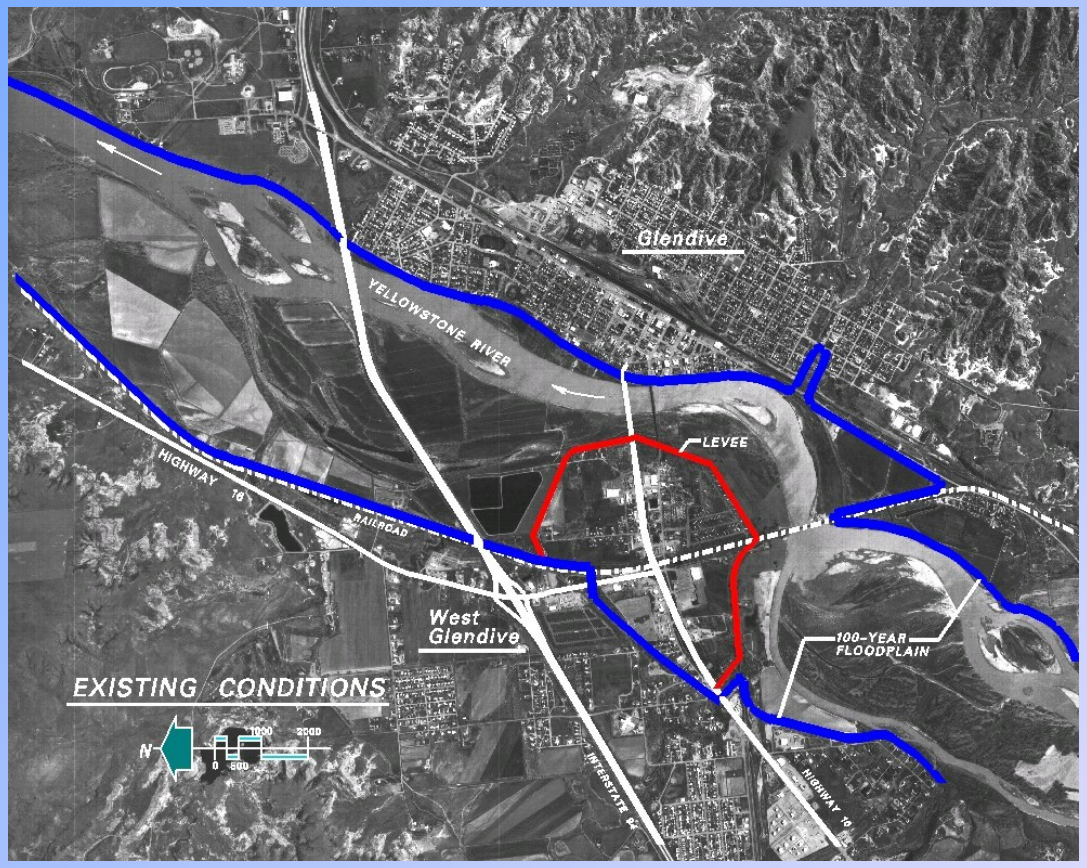
US Army Corps of Engineers

Flood Proofing

NATIONAL FLOOD PROOFING COMMIT

Glendive, MT

US Army Corps
of Engineers



US Army Corps of Engineers
Flood Proofing
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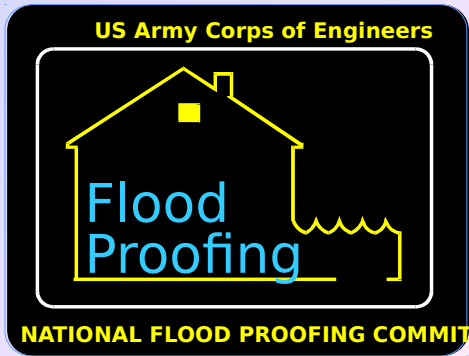
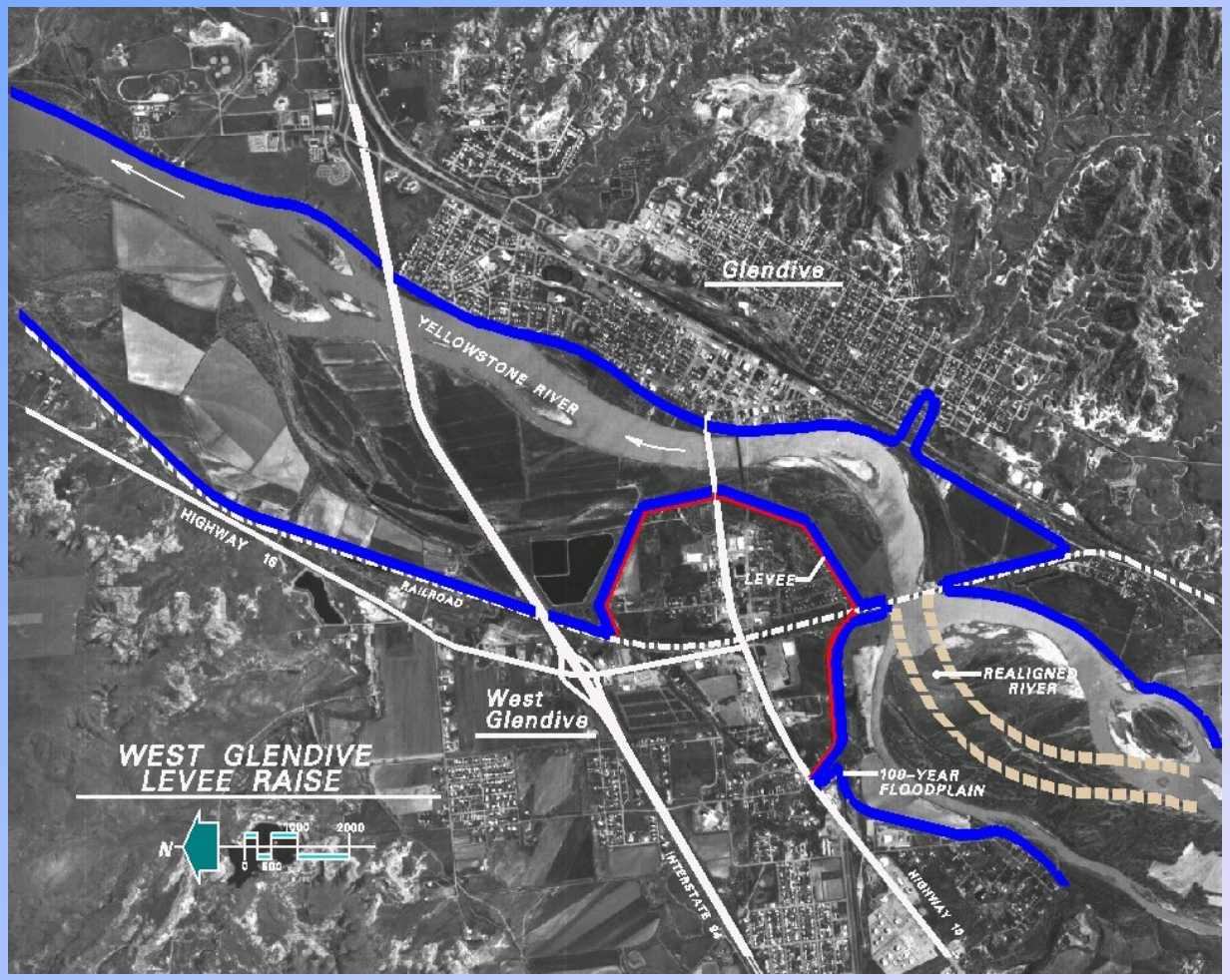
US Army Corps
of Engineers

- Corps Investigation
  - Traditional Structural Investigation
    - West Glendive Levee Raise
    - BCR ~ .7



US Army Corps
of Engineers



US Army Corps of Engineers

Flood Proofing

NATIONAL FLOOD PROOFING COMMIT

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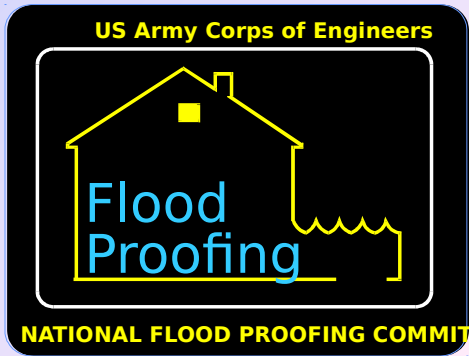
- Corps Investigation (cont)
  - Non structural investigation
    - Remove structures only
    - BCR ~ 0.70



US Army Corps
of Engineers

Opportunities the Innovation Flood Plain

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New Uses of

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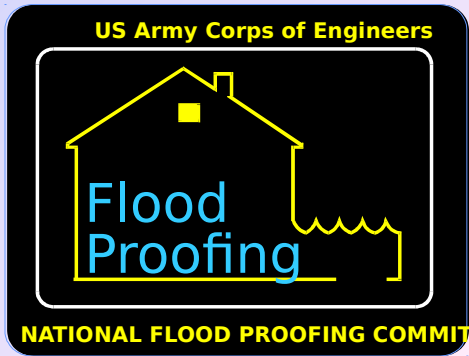
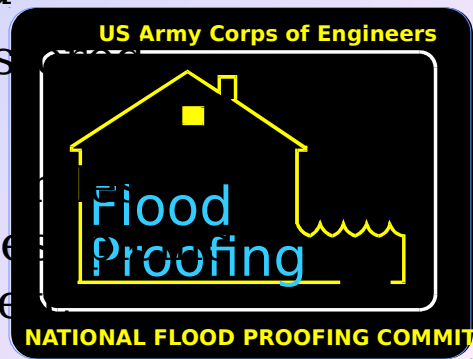


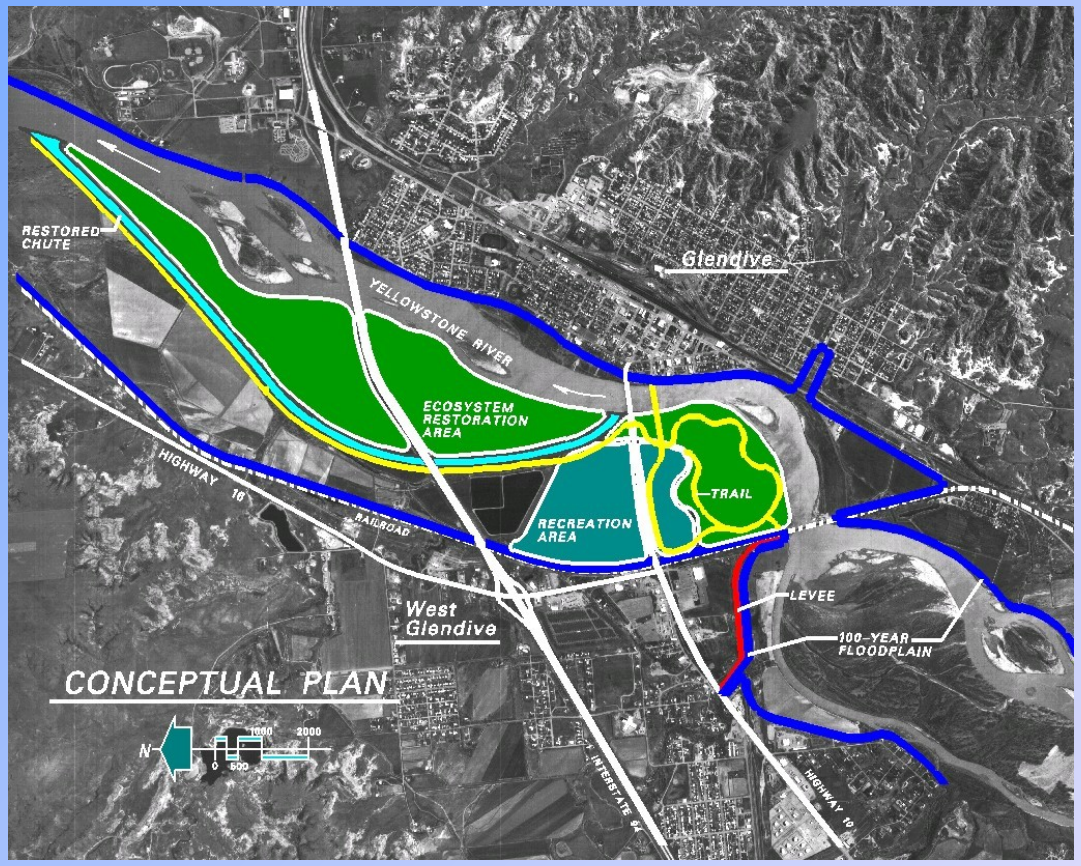
US Army Corps
of Engineers

- Non-structural Investigation
  - Install new I-94 bridge over closed chute, reopen chute, remove 2/3's of the levee, relocate 150 residential and commercial structures, use the evacuated flood plain for recreation and ecosystem restoration use
  - Majority of flood prone West Glendive structures removed from 100-yr flood plain
  - Flood stages for the ice affected 100-yr flood lowered a maximum of 3 ft
  - NFIP violation structures are mitigated
  - Ecosystem vastly improved through res
    chute and flood plain
  - Recreation facilities improved with 5.5
    of new trails, canoe launche
    and playground areas, e



Glendive, MT

US Army Corps
of Engineers



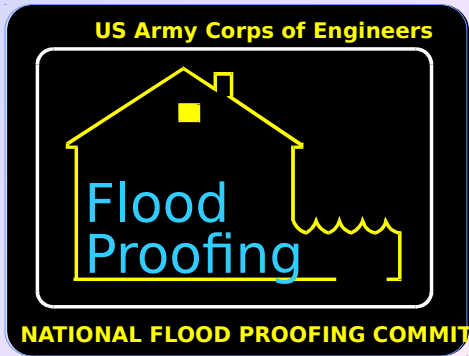
US Army Corps of Engineers
Flood Proofing
NATIONAL FLOOD PROOFING COMMIT

US Army Corps
of Engineers

- Structural
  - BCR ~ 0.7
- Non Structural
  - Flood damage reduction only

    BCR ~ .70
  - Flood damage reduction and recreation in the evacuated flood plain and recreation in the ecosystem restoration area

    BCR ~ 1.0



US Army Corps
of Engineers

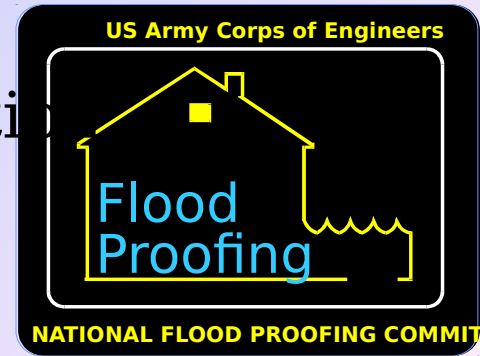
Project Cost

Ecosystem Restoration	Costs for NER purpose	Costs for NED purpose
Interstate 94 Bridge Construction (100-ft)	$ 474,000	$ 0
Bypass Chute Construction (100-ft)	$ 2,381,000	$ 0
Levee Removal	$ 1,054,000	$ 0
Land	$ 355,000	$ 0

US Army Corps of Engineers
Flood Proofing
NATIONAL FLOOD PROOFING COMMIT

US Army Corps
of Engineers

- Structural
  - BCR ~ 0.7
- Non Structural
  - Flood damage reduction only
    - BCR ~ .70
  - Flood damage reduction and recreation
    - BCR ~ 1.0
  - Flood damage reduction and recreati
    and ecosystem restoration
    - BCR ~ 1.4



US Army Corps
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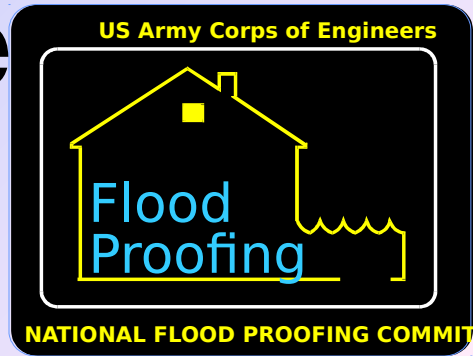
Community Support ?
Positive

Considering the Feasibility Phase



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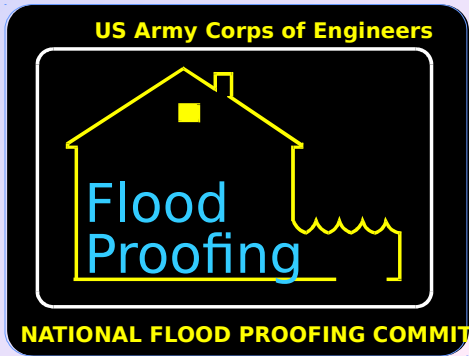
Multi-Agency Partnership Potential



US Army Corps
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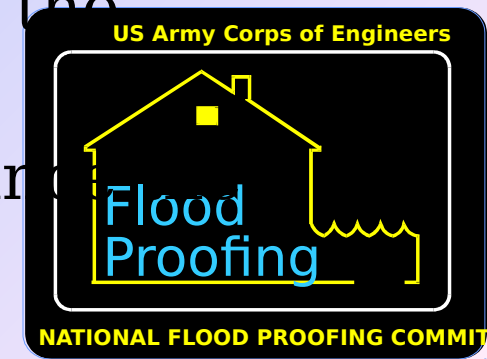

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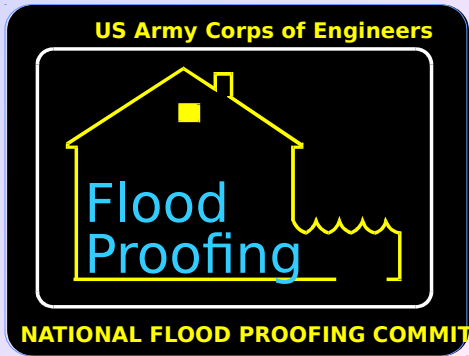
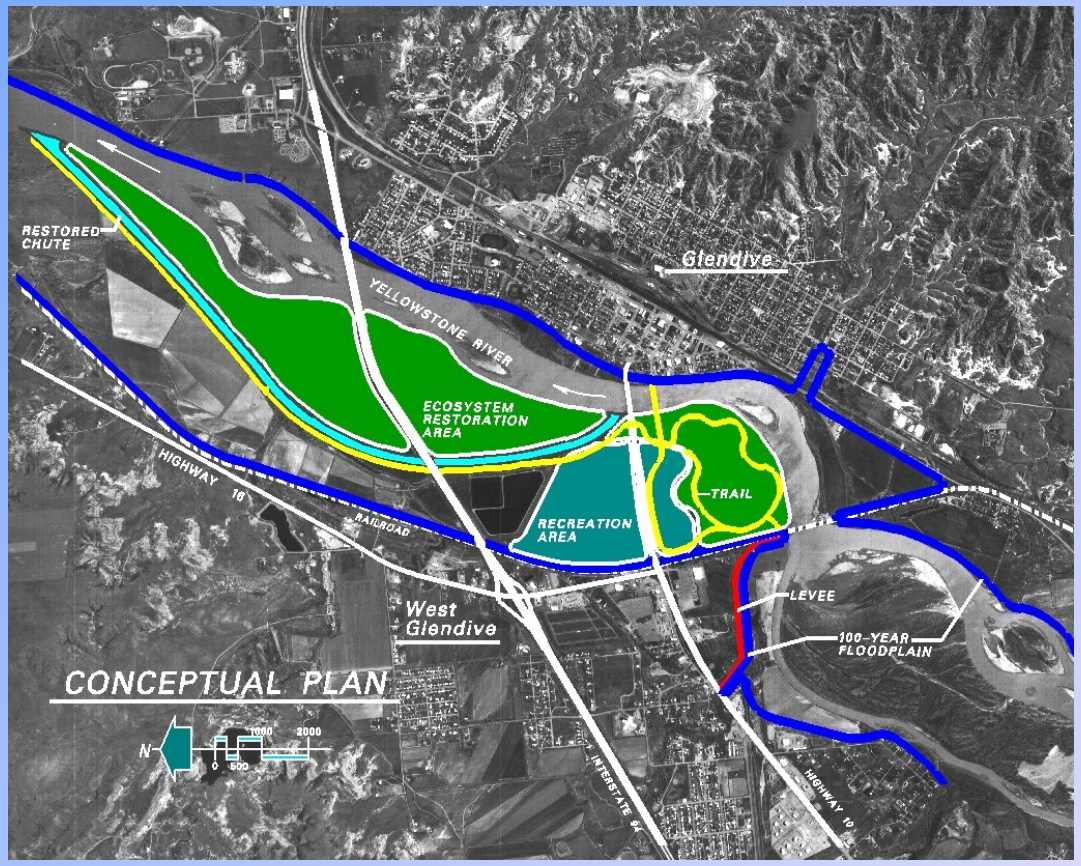
What is the Challenge ?



Glendive, MT

US Army Corps
of Engineers



US Army Corps of Engineers
Flood Proofing
NATIONAL FLOOD PROOFING COMMIT

US Army Corps
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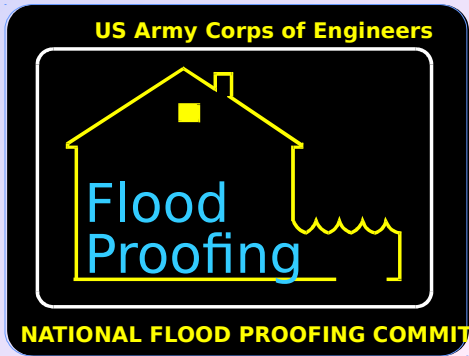
Leadership
in
Environmental Sustainability
in
Flood Damage Reduction



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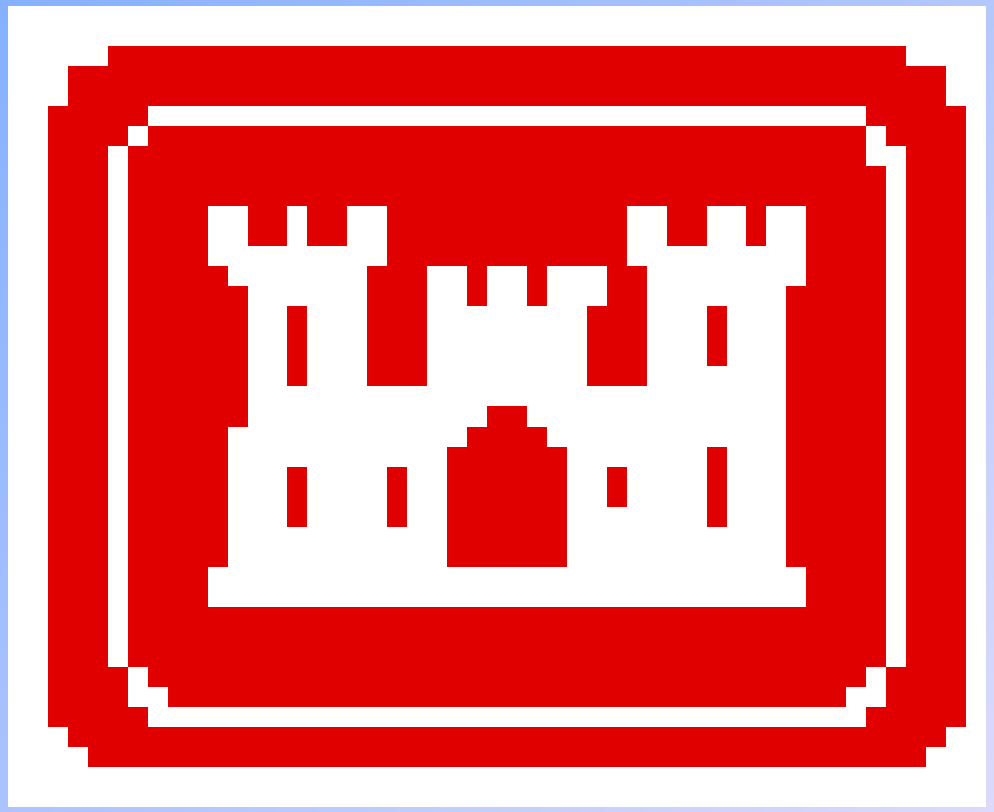

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